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ARTICLE

Socio-economic status, mastery-approach goals and learning-related outcomes: Mediation and moderation

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Abstract

Background: Socio-economic status is one of the most important factors shaping students' motivation and achievement but has seldom been explored in relation to achievement goals.

Aims: This study aimed to investigate whether mastery-approach goals explain the link between SES and key learning-related outcomes (*mediation*) and whether SES modifies the relationship between mastery-approach goals and these outcomes (*moderation*).

Sample: Data came from 595,444 students nested in 21,322 schools across 77 countries.

Methods: Data were analysed using multilevel-moderated mediation analyses.

Results: We found significant mediation and moderation. In terms of mediation, mastery-approach goals mediated the association between family SES and learning-related outcomes. However, a different pattern emerged for school SES, as students in higher SES schools had lower mastery-approach goals. In terms of moderation, we found that family SES strengthened the association between mastery-approach goals and learning-related outcomes. However, the association between mastery-approach goals and learning-related outcomes was weaker in higher SES schools.

Conclusion: Theoretical and practical implications for the achievement goal approach to achievement motivation are discussed.

KEYWORDS

achievement goals, mastery-approach goals, PISA, socio-economic status

Achievement goals are central to student motivation (Elliot & Hulleman, 2017). Among the different achievement goals, mastery-approach goals are regarded as the most adaptive. Students who endorse mastery-approach goals accrue a highly positive set of outcomes, including higher levels of academic achievement, perceived competence and intrinsic motivation (Elliot & Thrash, 2001; Huang, 2011, 2016; Hulleman et al., 2010).

The vast majority of achievement goal research has focused on how goals predict key educational outcomes (Elliot & Murayama, 2008; Huang, 2012; Hulleman et al., 2010). Relatively little work has been conducted to examine how broader structural conditions such as socio-economic status (SES) relate to achievement goals. Among the most impactful structural conditions are family SES and school SES, which shape the opportunities and challenges that characterize the everyday life of students (Sirin, 2005). These structural conditions have the power to influence students' psychological experiences and ways of self-regulating, including their adoption and pursuit of achievement goals and downstream educational outcomes. Furthermore, these conditions might also moderate the relationship between achievement goals and educational outcomes.

In this study, we examine the interplay between SES, achievement goals, in particular mastery-approach goals, and key learning-related outcomes. More specifically, we investigate whether mastery-approach goals mediate the effects of SES on key learning-related outcomes and examine whether there are differential effects of mastery-approach goals on these outcomes depending on students' socio-economic backgrounds.

Achievement goals

Achievement goals pertain to 'aims that focus on competence' (Elliot & Murayama, 2008, p. 614). They create a framework through which individuals construe experience and invest themselves in achievement-relevant situations (Elliot & Thrash, 2001). One of the core ideas of the achievement goal approach to achievement motivation is that goals can be distinguished in terms of how students define competence. Mastery-focused students define competence in terms of how they are doing relative to task demands or their prior performance (e.g., do better than I have done before), while performance-focused students define competence in terms of how they are doing relative to others (e.g., do better than my classmates; Dweck, 1986). One of the most prominent achievement goal models—the 2×2 achievement goal framework (Elliot & Murayama, 2008; Elliot & Thrash, 2001)–crosses these definitions of competence with approach and avoidance motivation, yielding four types of goals: mastery-approach, performance-approach, performance-avoidance and mastery-avoidance.

In this study, we focus specifically on mastery-approach goals. Several meta-analytic studies have found a positive association between mastery-approach goals and achievement outcomes (Huang, 2012, 2016; Hulleman et al., 2010; Payne et al., 2007). Apart from achievement, mastery-approach goals are also positively related to other key outcomes such as higher levels of perceived competence and intrinsic motivation (Urdan & Kaplan, 2020). Hence, in this study, we investigate the association of mastery-approach goals not only with academic achievement, but also with additional learning-related outcomes—perceived competence and intrinsic motivation—to provide a more comprehensive picture of the role of mastery-approach goals on key learning-related outcomes.

Socio-economic status (SES)

One of the most important contexts that shape students' development, learning and achievement is socio-economic status (SES) (Sirin, 2005). Several studies have found persistent effects of SES on students' achievement (Rodríguez-Hernández et al., 2020; Sirin, 2005). SES has been defined in different ways. Some studies have defined SES in a broad fashion, distinguishing between first-generation and second-generation students or between those receiving reduced lunch versus those not (e.g., Berger

& Archer, 2016; Jury et al., 2015). Other studies have used more precise and comprehensive measures of SES, which typically include parents' education, occupational prestige and income (Sirin, 2005). Although there is no consensus on which SES measure is the best, studies have shown that SES measures comprised of multiple components and more fine-grained information usually perform better than those that are broader and less comprehensive (Lee et al., 2019).

In PISA 2018, the source of the data for this study, *family SES* is measured using economic, social and cultural status (ESCS), defined as 'a measure of students' access to family resources (financial capital, social capital, cultural capital and human capital) which determine the social position of the students' family/household' (Avvisati, 2020, p. 3). The economic, social and cultural status indicator in PISA is one of the most well-known and oft-used SES indicators in the educational literature, as it includes a variety of types of information, making it more comprehensive and robust relative to alternatives (Agasisti et al., 2021; Avvisati, 2020).

Apart from family SES, another way to operationalize SES is through *school SES*. School SES pertains to the school average of students' family-based economic resources (van Ewijk & Sleegers, 2010). Both family and school SES are important predictors of academic achievement (Sirin, 2005; van Ewijk & Sleegers, 2010).

Most achievement goal studies that have included measures of SES have only focused on family SES (Darnon et al., 2018; Jury et al., 2015). Few studies have considered school SES. To the best of our knowledge, past studies have not explored how family and school SES jointly predict students' mastery-approach goal pursuit. This is a key shortcoming given that family and school SES form an important part of students' social contexts and shape their daily experiences inside and outside school to a considerable extent (Destin et al., 2019; King et al., 2022). More importantly, past studies have also demonstrated that family and school SES effects are distinct and make unique contributions to the prediction of learning-related outcomes (van Ewijk & Sleegers, 2010; Yeung et al., 2022). Hence, in this study, we included both family and school SES.

Learning-related outcomes

Achievement goals set in motion distinct cognitive, emotional and behavioural processes, and they exert a proximal influence on competence-relevant outcomes (Elliot & Hulleman, 2017; Huang, 2012, 2016). In this study, we focused on how mastery-approach goals were associated with academic achievement, as well as other learning-related outcomes such as perceived competence and intrinsic motivation.

Achievement is the most common outcome examined in relation to mastery-approach goals. These goals are viewed as beneficial for performance because they facilitate task-absorption, persistence and effort. Prior meta-analytic studies have found that mastery-approach goals are positively associated with academic achievement, with the magnitude usually in the low double digits (e.g., $r = .11$ in Hulleman et al., 2010; see also Van Yperen et al., 2014; Wirthwein et al., 2013).

Mastery-approach goals are also viewed as beneficial for perceived competence to accomplish a certain task (also referred to as self-efficacy). These goals focus on learning and skill development. Hence, when mastery-approach-oriented students meet obstacles and failures, their sense of competence is not undermined. Prior meta-analytic studies have shown that mastery-approach goals are positively associated with perceived competence, with a magnitude usually in the .30 s (e.g., $r = .31$, Payne et al., 2007; see also Cellar et al., 2011; Huang, 2016).

Like achievement, intrinsic motivation (also referred to as interest) is considered a 'gold standard' achievement outcome (Korn & Elliot, 2016, p. 4). Mastery approach goals are viewed as beneficial for intrinsic motivation because these goals retain a focus on the task, promote challenge-seeking and support students' sense of autonomy and agency. Prior meta-analytic (and narrative) reviews have found that mastery-approach goals are positively associated with intrinsic motivation, with a magnitude usually in the .40 s (e.g., $r = .44$, Hulleman et al., 2010; see also Huang, 2011; Scherrer et al., 2020). We should add that each of the focal outcome variables may be conceptualized as outcomes or antecedents

of achievement goals; in this work, we are simply focused on associations, with a realization that any observed links are likely bidirectional.

Mastery-approach goals and SES

Students from different socio-economic backgrounds are exposed to different types of instruction, opportunities and resources (Sirin, 2005). Hence, both family and school SES may influence the extent to which students adopt mastery-approach goals that, in turn, influence learning-related outcomes (*mediation*). Furthermore, the impact of mastery-approach goals on learning-related outcomes may vary for students from high and low SES groups (*moderation*). We elaborate on these two mechanisms below.

Mediation

A growing body of research suggests that family SES may influence academic outcomes in part through psychological mechanisms (e.g., Stephens et al., 2019). For example, socio-economic contexts can influence students' family and school experiences, how they perceive themselves and the educational opportunities available to them. Students from high-SES families and high-SES schools tend to have peers who hold more positive attitudes and values towards school and are also exposed to adults who are more supportive of their learning goals (Chiu & Chow, 2015). Hence, it is possible that higher family and school SES might positively predict the adoption of mastery-approach goals.

Though there is preliminary evidence for a mediational mechanism, the relationship between achievement goals, in particular mastery-approach goals, and SES is not yet clearly established. For example, Berger and Archer (2016) found that students in high-SES schools endorsed mastery-approach goals more strongly than those in low-SES schools. Qualitative studies have also supported the contention that students from varying SES backgrounds have different levels of mastery-approach goals (Berger & Archer, 2018). For example, Berger and Archer (2018) found that students from low-SES schools showed 'little evidence of a mastery orientation' (p. 799).

However, some studies have failed to find a significant relationship between SES and mastery-approach goals. For example, Darnon et al. (2018) did not find a correlation between mastery-approach goals and family SES among college students. Likewise, Kaplan and Maehr (1999) did not find a significant difference between any form of achievement goal, including mastery-approach goals and family SES.

Perhaps, at least part of the reason for these ambiguous findings is the small sample sizes and lack of precision in the SES measures in these past studies. Herein, we address the methodological limitations of past studies by using a large cross-national sample of students across a wide range of schools and countries. We used PISA's operationalization of SES as students' economic, cultural and social resources, which draws on multiple sources of information and hence provides a more comprehensive measure of SES. We also included both family and school SES.

Moderation

Family and school SES could also potentially moderate the effects of mastery-approach goals on learning-related outcomes. Past studies provide empirical support for this moderation mechanism. For example, Smeding et al. (2013) found that when mastery-approach goals were emphasized, the SES-achievement gap decreased in the university context. Students with low family SES were able to achieve as much as their higher SES counterparts when assessments were framed as a way to attain mastery (i.e., emphasized mastery-approach goals) rather than when assessments were framed as a way to select the best students and to demonstrate performance (i.e., emphasized performance-approach goals). In

another study, Darnon et al. (2018) found that mastery-approach goals only predicted academic achievement among students from lower SES families, suggesting that mastery-approach striving might be especially useful for less advantaged students.

This study examines whether such an interactive relationship between mastery-approach goals and family and school SES is present and, if so, will investigate the nature of the interactive relationship. There are three possibilities in terms of how SES could moderate the effects of mastery-approach goals on learning-related outcomes.

Universalist hypothesis: The relationship between mastery-approach goals and outcomes is not moderated by SES

Mastery-approach goals could be beneficial for students across all socio-economic strata. This is based on the idea that an education centred on mastery and learning favours all types of students, not just those from more privileged backgrounds. Though relatively few studies have directly tested whether mastery-approach goals are universally beneficial or not, there is a large body of work on achievement goals providing indirect support for the universalist hypothesis. For example, although most achievement goal studies have been conducted in relatively affluent economic environments in North America and Europe, some studies have focused on less advantaged environments in Southeast Asia, the Middle East and Africa (e.g., King et al., 2017, 2019; Musa et al., 2016). Across these studies, mastery-approach goals have been found to be the most adaptive relative to other types of achievement goals. Furthermore, meta-analytic studies have documented that mastery-approach goals are beneficial for individuals of different genders, ethnicities, ages and cultural backgrounds (Hulleman et al., 2010; Payne et al., 2007). Although these studies did not explicitly test the interaction effect between mastery-approach goals and SES, they suggest that achievement goals are adaptive across diverse populations, providing indirect support for the universalist hypothesis.

Amplification hypothesis: High SES strengthens the effects of mastery-approach goals on outcomes

The amplification hypothesis would be substantiated if socio-economic status strengthened the relationship between mastery-approach goals and learning-related outcomes. Support for this amplification hypothesis comes from Scarr (1992) who argued that the process by which 'people sort themselves into environments according to their interests, talents, and personality…depends on people having a varied environment from which to choose and construct experiences' which seems less likely for students living 'in very disadvantaged circumstances' (p. 9). Students are better able to invest their time and effort in learning when given ample and regular opportunities to do so. Students from high-SES families and schools enjoy significantly more opportunities for educational success. For example, high-SES parents may be better able to purchase the books that pique their children's interest. More affluent schools have better-qualified teachers, more rigorous curricula and plentiful material resources to support their students' learning (Rowe & Perry, 2020).

Students who endorse mastery-approach goals follow where their interests lead them and choose activities that would help them develop their skills and competencies. This presupposes choice in the activities that they can select and having a varied enough environment from which they can capitalize on opportunities to learn and develop. Hence, students from high-SES families and schools might be more likely to capitalize on the benefits of mastery-approach goals, support the amplification hypothesis.

Reduction hypothesis: High SES weakens the effects of mastery-approach goals on outcomes

Socio-economic status could also weaken the relationship between mastery-approach goals and learning-related outcomes. Perhaps in high-SES contexts, the relationship between mastery-approach goals and learning-related outcomes is less strong, as there are multiple opportunities and resources that could enable students to succeed over and above these goals (Stephens et al., 2019; Tucker-Drob et al., 2014; Zheng et al., 2019). For example, in well-resourced environments, it is possible that even students with low levels of mastery-approach goals could become engaged in school and succeed, to the extent that they may not need to rely as much on their own internal motivational

resources. Numerous prior studies have noted the multiple advantages that accrue to high-SES individuals in the school system and the concomitant disadvantages faced by low-SES students (Jury et al., 2017; Stephens et al., 2019).

Indirect evidence for the reduction hypothesis can be found in past studies that drew on human capital theory, which postulates that different skills or attributes may complement or substitute each other in predicting educational outcomes (Heckman, 2007). For example, studies have shown that for more advantaged children, having low cognitive ability may not prove to be that detrimental, given that they can deploy their non-cognitive skills to compensate for low levels of cognitive ability (Gil-Hernández, 2021).

By extension, it is possible that students from high-SES families and schools could still attain optimal outcomes regardless of whether they have high levels of mastery-approach goals or not. Family and school resources might be able to compensate for their lack of mastery-approach goals, providing indirect support for the reduction hypothesis.

THIS STUDY

In this research, we examined the interplay between SES, mastery-approach goals and key learning-related outcomes. We only focused on mastery-approach goals given that this is the only type of achievement goal included in PISA 2018.[1] We tested mastery-approach goals as a mediator and posited that these goals would link family and school SES to the focal learning-related outcomes. More specifically, we posited the following hypotheses, which were generated *a priori*:

Hypothesis 1a. Family SES positively predicts the focal learning-related outcomes and mastery-approach goals mediate this relationship.

Hypothesis 1b. School SES positively predicts the focal learning-related outcomes and mastery-approach goals mediate this relationship.

Next, we tested whether the effects of mastery-approach goals on the focal learning-related outcomes would be moderated by family and school SES. In terms of *family* SES, the following competing hypotheses were tested:

Hypothesis 2a. Family SES does not moderate the association between mastery-approach goals and the focal learning-related outcomes (universalist hypothesis).

Hypothesis 2b. Family SES strengthens the positive association between mastery-approach goals and the focal learning-related outcomes (amplification hypothesis).

Hypothesis 2c. Family SES weakens the positive association between mastery-approach goals and the focal learning-related outcomes (reduction hypothesis).

[1]Among the different achievement goals, only mastery-approach goals are included in PISA 2018. The competition items in PISA assess the competitiveness motive, not performance-approach goals. Competitiveness is conceptualized as a disposition that serves an energizing function, and it is distinct from achievement goals that serve a directional function. In the hierarchical model of achievement motivation, motives and goals are conceptually and empirically distinct (Elliot, 2005). The approach achievement motive (also labelled need for achievement) includes both workmastery and competitiveness motives. Given that (a) workmastery and competitiveness do share one conceptual similarity with mastery-approach and performance-approach goals—that is, workmastery and mastery-approach goals both emphasize the task, whereas competitiveness and performance-approach goals both emphasize others, and (b) PISA 2018 includes both workmastery and competitiveness, we added text in the Data S1 that reports relations between these achievement motives and SES (See Appendices B and C).

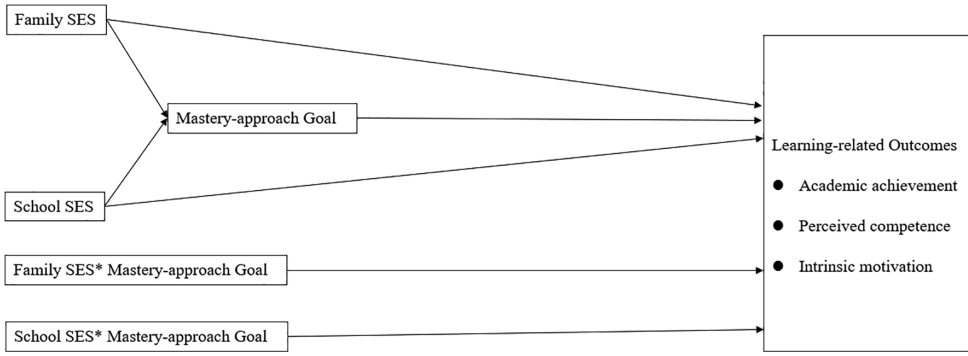

FIGURE 1 Conceptual model.

We extended the aforementioned hypotheses to test whether mastery-approach goals have differential effects on the focal learning-related outcomes of students from *schools* of varying socio-economic backgrounds:

> **Hypothesis 3a.** School SES does not moderate the association between mastery-approach goals and the focal learning-related outcomes (universalist hypothesis).
>
> **Hypothesis 3b.** School SES strengthens the positive association between mastery-approach goals and the focal learning-related outcomes (amplification hypothesis).
>
> **Hypothesis 3c.** School SES weakens the positive association between mastery-approach goals and the focal learning-related outcomes (reduction hypothesis).

We tested our hypotheses with PISA 2018 because it was the only PISA study to date that assessed students' mastery-approach goals and it is also the most recent PISA study to date. PISA 2018 focused on the reading domain. Hence, we operationalized the learning-related outcomes in terms of the reading domain. The conceptual model for this study is shown in Figure 1.

No manipulations were used in this study, and all variables analysed were reported. The data files are publicly available from PISA (OECD, 2019a). The main findings are presented in the article and the Data S1 has more detailed results, statistical codes and regression equations.

METHODS

Sample

Data for this study were drawn from the Program for International Student Assessment (PISA) 2018 database (http://www.oecd.org/pisa/data/2018database/). PISA is an international program organized by the Organization for Economic Cooperation and Development (OECD), designed to assess whether 15-year-old students are equipped with the reading, science and mathematics literacies to meet real-life challenges. Our sample was drawn from PISA 2018, which included 595,444 students nested in 21,322 schools across 77 countries.[2] The mean age of the participants was 15.79 (SD = .29) years, and 49.80% were females.

[2]We use the term countries to refer to countries, regions and economies. Some of the regions in this study are not countries *per se* (e.g., Hong Kong, Macau) but are part of a larger unit (i.e., China). However, these regions/economies have their own educational system. Hence, we analysed them separately in line with OECD's (2019a) approach.

Measures

All the variables used in this study were derived by PISA using item response theory (IRT). High reliability and validity have been validated and documented in the PISA 2018 technical report (OECD, 2019a). The cross-country comparability of the constructs has been assessed by the PISA group with multigroup Rasch models. Similar item parameters indicated the presence of measurement invariance of these variables across countries (OECD, 2019a).

Explanatory variables

Mastery-approach goals

Mastery-approach goals were operationalized with three items (e.g., 'My goal is to learn as much as possible'). Participants responded on a 5-point scale ranging from 1 (*Not at all true of me*) to 5 (*Extremely true of me*). These items were based on Elliot and Murayama's (2008) Achievement Goal Questionnaire-Revised. This scale demonstrated acceptable internal reliability, $\alpha = .86$.

Family SES

Family SES was measured through an index called economic, social and social status (ESCS) in the PISA database. This index measures students' responses regarding home possessions, parents' highest occupational status and parents' highest level of education (OECD, 2019a). The composite ESCS score was derived using a principal component analysis with zero mean and unit variance for students in equally weighted OECD countries.

School SES

School SES was the average of the family SES of students within the same school. This approach to measuring school SES has been used in past PISA studies (e.g., Chiu & Chow, 2015; King et al., 2022).

Outcome variables

Academic achievement

Academic achievement was operationalized in the domain of reading given that it was the focal subject in PISA 2018. Reading achievement was defined as 'understanding, using, evaluating, reflecting on, and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society' (OECD, 2019b, p.28). Students' reading achievement was scaled using item response theory (IRT) and transformed into a scale with a mean of 500 score points and a standard deviation of 100 score points.

Perceived competence

Perceived competence in the domain of reading was assessed with three items (e.g., 'I am a good reader'). It was measured on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). This scale was based on the PISA 2018 technical report (OECD, 2019a). This scale showed acceptable internal reliability, $\alpha = .77$.

Intrinsic motivation

Intrinsic motivation in the domain of reading was assessed with one item asking students how much time they usually read for enjoyment. It was rated on a 5-point scale: 'I do not read for enjoyment', '30 min or less a day', 'More than 30 min to less than 60 min a day', '1–2 h a day' and 'More than 2 h a day'. This scale was derived from the PISA 2018 technical report (OECD, 2019a).

Covariates

Three covariates were selected *a priori*. These covariates were gender (0 = male and 1 = female), grade level and immigration status (0 = immigrant and 1 = native).

Data analysis

Methodological considerations

Missing data

The percentage of missing data for all variables was small, with a maximum of 11% for mastery-approach goals. The missing data were imputed by Markov Chain Monte Carlo (MCMC) multiple imputations. Ten imputed data sets were created, and one plausible value for reading achievement was assigned to each imputed data set. This method can improve the estimation accuracy and outperforms other methods, such as pairwise and listwise deletion (Peugh & Enders, 2004).

Plausible values

Due to the balanced incomplete block design of the reading test, each student was randomly assigned to complete one test booklet with only a subset of items. Ten plausible values were estimated based on students' responses to the assigned test items and background questionnaires for decreasing estimation errors (OECD, 2019a). We repeated all analyses 10 times for each plausible value and reported the mean of parameter and sampling error estimates via Rubin's rules (Rubin, 1987).

Weights

Student sampling weights, created by PISA, were employed to consider sampling error and make inferences about the population (OECD, 2019a).

Nested nature

PISA data were nested, whereby students were nested within schools, and schools were nested within countries. Hence, 3-level linear modelling was employed to disentangle the residuals at the student, school and country levels to reduce estimation biases.

Centring

Student-level variables were group-mean centered relative to the school group mean, and the school-level variables were group-mean centered relative to the country group mean (Brincks et al., 2017). This approach enabled us to appropriately partition the within- and between-group effects (Enders & Tofighi, 2007; Lüdtke et al., 2009).

Model construction

Using a sequential procedure (Raudenbush & Bryk, 2002), a 3-level moderated mediation model was developed with three steps to test our hypotheses. All the mathematical equations can be found in the Data S1 (see Appendix D).

Model 0 (Null model)

M0 was an unconditional model only with intercept. The intraclass correlation coefficient (ICC) was computed to examine the proportion of the variance in academic achievement (M0a), perceived competence (M0b) and intrinsic motivation (M0c) that was explained by the student, school and country level factors.

Model 1 (Multilevel mediation model)

M1 was developed to explore whether mastery-approach goals mediated the influence of family and school SES on learning outcomes (i.e., H1a, H1b).

Model 2 (Multilevel moderated mediation model)

M2 was built based on M1. The student-level interaction between family SES and mastery-approach goals, as well as the cross-level interaction between school SES and mastery-approach goals, was added to examine whether the effects of mastery-approach goals on the outcomes would be moderated by family- and school-SES (i.e., *H2 and H3*). This model included a random slope on mastery-approach goals at the student level, which is crucial for analysing cross-level interactions (Heisig & Schaeffer, 2019).

The 'MplusAutomation' package in R 4.2.0 was used to create and run syntax files created by Mplus 8.0 (Hallquist, 2011). The robust maximum likelihood estimator (MLR) was used due to its robustness to non-normality and non-independence data. Furthermore, all continuous variables were standardized ($M = 0$ and SD = 1), and dichotomous variables were scored 0 or 1 to facilitate interpretation. The syntax files can be found in the Data S1.

Effect sizes

We computed the effect sizes of the interaction terms by following Tymms' (2004) formula: effect size = $(2\beta * \mathrm{SD}_{\mathrm{predictor}})/\sigma_e$, where β is the unstandardized regression coefficient, SD is the standard deviation of the predictor variable and σ_e is the residual standard deviation at the student level. In addition, we used the method proposed by MacKinnon (2008) to compute effect sizes for mediation effects: effect size = (ab/S_y), where ab is the estimation of the mediation effect and S_y is the standard deviation of the dependent variable. In our study, all variables were standardized first; hence, the effect sizes were equal to ab (Miočević et al., 2018). Both methods have been widely used in existing research to compute effect sizes for moderation (e.g., Heemskerk et al., 2023; Marsh et al., 2008) and mediation effects (e.g., Li et al., 2021; Thakur et al., 2023). Consistent with the newer guidelines on effect sizes, .01, .09 and .25 were used as the criteria for small, medium and large effect sizes, respectively (Preacher & Kelley, 2011; see also Gignac & Szodorai, 2016; Götz et al., 2022).

RESULTS

Descriptive statistics

Table 1 shows the means, standard deviations and correlations among the study variables. Table 1 indicates that mastery-approach goals were positively related to academic achievement, perceived competence and intrinsic motivation.

We also calculated the descriptive statistics in all the 77 countries (see Appendix A in the Data S1), and the results were consistent with those obtained from the overall sample.

Intra-class correlations (ICCs)

The ICCs indicated that 26.8% and 35.8% of the total variance in achievement, 3.5% and 5.4% of the total variance in perceived competence, and 3.3% and 7.8% of the total variance in intrinsic motivation were explained at the school and country levels respectively. These values justified the application of a 3-level analysis to account for the variance that occurred at the school and country level.

TABLE 1 Means, standard deviations and correlations among the variables.

	1	2	3	4	5	6	7	8	9
1. Family SES	–								
2. School SES	.68**	–							
3. Mastery-approach goals	.04**	−.02**	–						
4. Academic achievement	.39**	.47**	.02**	–					
5. Perceived competence	.19**	.13**	.26**	.27**	–				
6. Intrinsic motivation	.02**	−.04**	.16**	.12**	.30**	–			
7. Gender (1 = female)	−.01**	.02**	.09**	.13**	.08**	.22**	–		
8. Grade level	.22**	.26**	.01**	.25**	.09**	.01**	.06**	–	
9. Immigration (1 = native)	−.04**	−.13**	−.03**	−.03**	−.03**	.00**	.00**	−.01**	–
Mean	−0.28	−0.28	0.11	454.47	−0.03	2.40	0.50	−0.17	0.88
SD	1.12	0.76	1.05	106.19	0.97	1.30	0.50	0.63	0.33

**$p < .01$.

TABLE 2 Parameter estimates for the multilevel mediation model.

	Mastery-approach goals	Academic achievement (M1a)	Perceived competence (M1b)	Intrinsic motivation (M1c)
	β (SE)	*β* (SE)	*β* (SE)	*β* (SE)
Student level				
Mastery-approach goals		.05 (.01)***	.21 (.01)***	.11 (.00)***
Family SES	.08 (.01)***	.09 (.01)***	.12 (.01)***	.07 (.00)***
Gender	.16 (.01)***	.18 (.01)***	.12 (.01)***	.42 (.02)***
Grade level	.02 (.01)***	.18 (.01)***	.04 (.00)***	.01 (.00)**
Immigration status	−.09 (.01)***	.05 (.04)	−.01 (.02)	−.14 (.01)***
School level				
School SES	−.05 (.01)***	.31 (.02)***	.09 (.01)***	.05 (.01)***
Random variance components				
Country level	.00 (.00)	.21 (.03)	.05 (.01)	.08 (.01)
School level	.00 (.00)	.12 (.01)	.03 (.00)	.02 (.00)
Student level	.99 (.02)	.48 (.02)	.84 (.02)	.83 (.01)

Note: **$p < .01$ and ***$p < .001$. Standardized coefficients are reported. Estimates in parentheses refer to SE.

Mediation

We first tested whether family and school SES predicted mastery-approach goals. The results in Table 2 indicate that family SES positively influenced mastery-approach goals ($\beta = .08$, SE = .01, $p < .001$), while school SES was negatively associated with mastery-approach goals ($\beta = -.01$, SE = .00, $p < .001$). Then, we tested whether mastery-approach goals mediated the effect of family-SES (H1a) and school-SES (H1b) on learning-related outcomes.

The test of mediation indicates that mastery-approach goals mediated the relationship between family SES and academic achievement (effect size = .004, SE = .00, $p < .001$), between family SES and perceived competence (effect size = .017, SE = .00, $p < .001$) and between family SES and intrinsic motivation (effect size = .009, SE = .00, $p < 0.001$). Hence, H1a was supported.

In comparison, school SES negatively predicted mastery-approach goals, which contradicted H1b as we initially posited a positive relationship between school SES and mastery-approach goals. Mastery-approach goals mediated the school SES effects on academic achievement (effect size = −.000, SE = .00, $p < .008$), perceived competence (effect size = −.001, SE = .00, $p < .001$) and intrinsic motivation (effect size = −.001, SE = .00, $p < .001$).

Moderation

We then examined whether family- and school-SES moderated the relationship between mastery-approach goals and learning-related outcomes. As shown in Table 3, at the student level, the interaction between family SES and mastery-approach goals was not significant in predicting reading achievement ($\beta = .00$, SE = .00, $p > .05$, effect size = .00), while their interaction effect was significant for perceived competence ($\beta = .01$, SE = .00, $p < .001$, effect size = .02) and intrinsic motivation ($\beta = .01$, SE = .00, $p < .001$, effect size = .02). This indicates that in high-SES families, the relationship between mastery-approach goals and learning-related outcomes was stronger. Hence, the amplification hypothesis (H2b) was partially supported (for two of the three outcomes) at the student level.

At the school level, the interaction between school SES and mastery-approach goals was associated with academic achievement ($\beta = -.01$, SE = .00, $p < .06$, effect size = −.03) and perceived competence ($\beta = -.01$, SE = .00, $p < .05$, SE = .00, effect size = −.02), while school SES did not moderate the relationship between mastery-approach goals and intrinsic motivation ($\beta = -.00$, $p > .05$, SE = .00, effect size = .00). This meant that in higher SES schools, the relationship between mastery-approach goals and

TABLE 3 Parameter estimates for the multilevel moderated model.

	Academic achievement (M2a)	Perceived competence (M2b)	Intrinsic motivation (M2c)
	β (SE)	β (SE)	β (SE)
Student level			
Mastery-approach goals	.05 (.01)***	.21 (.01)***	.11 (.00)***
Family SES	.09 (.01)***	.11 (.01)***	.07 (0.00)***
Gender	.18 (.01)***	.12 (.01)***	.41 (0.02)***
Grade level	.18 (.01)***	.04 (.00)***	.01 (0.00)**
Immigration status	.05 (.04)	−.01 (.02)	−.14 (0.01)***
School level			
School SES	.31 (.02)***	.09 (.01)***	.05 (.01)***
Moderation			
Family SES*mastery-approach goals	.00 (.00)	.01 (.00)***	.01 (.00)***
School SES*mastery-approach goals	−.01 (.00)†	−.01 (.00)*	.00 (.00)
Random slope variance			
Country-level mastery goals	.00 (.00)	.00 (.00)	.00 (.00)
School-level mastery goals	.00 (.00)	.00 (.00)	.00 (.00)
Random variance components			
Country-level	.21 (.03)	.05 (.01)	.08 (.01)
School-level	.13 (.01)	.03 (.00)	.02 (.00)
Student-level	.48 (.02)	.83 (.02)	.83 (.01)

Note: † < .06, *p < .05, **p < .01 and ***p < .001. Standardized coefficients are reported.

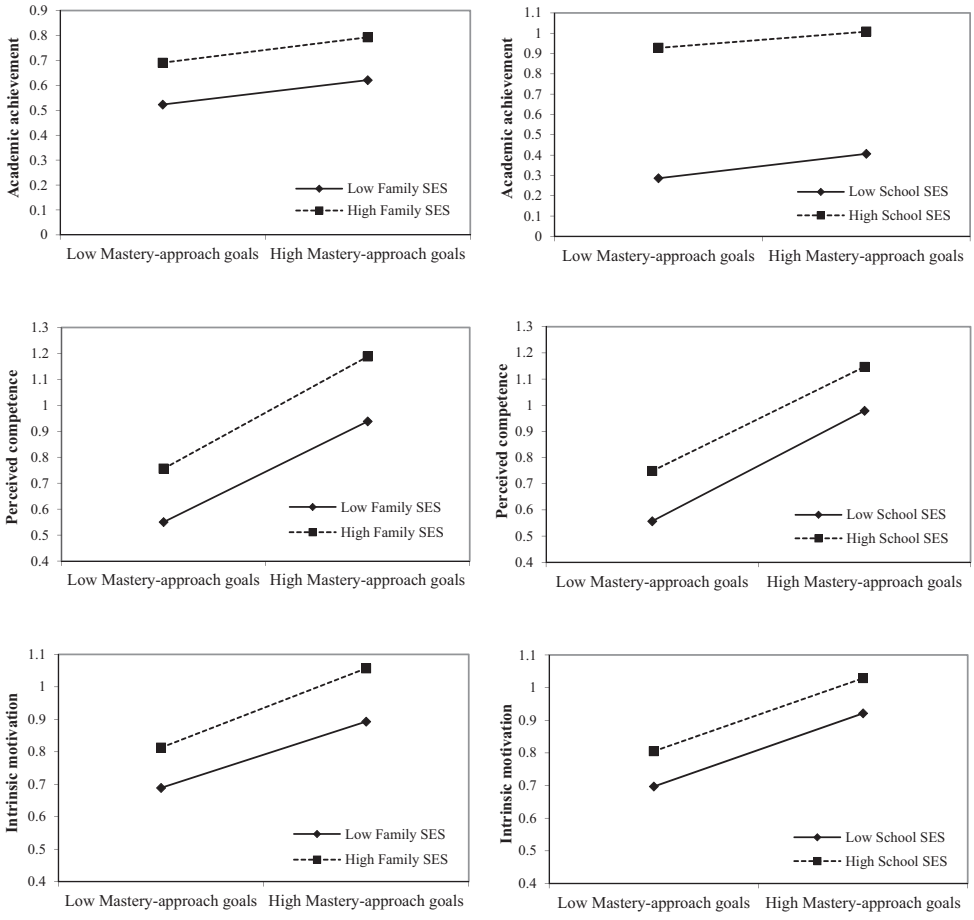

FIGURE 2 Family and School SES as moderators of mastery-approach goals. Lines are plotted for the outcomes at higher and lower (±1 SD) values of the moderator.

learning-related outcomes was weaker. Hence, the reduction hypothesis (H3c) was partially supported (for two of the three outcomes) at the school level. The moderation effects are displayed in Figure 2. The full moderated mediation model is shown in Figure 3.

DISCUSSION

This study aimed to examine the interplay between mastery-approach goals, family SES and school SES in relation to key learning-related outcomes. Our study yielded three important findings. First, mastery-approach goals mediated the effects of family SES and school SES on key learning-related outcomes. Second, we found general support for both the universalist and amplification hypotheses with regard to family SES. Family SES did not moderate the effects of mastery-approach goals on academic achievement, supporting the universalist hypothesis. However, the amplification hypothesis was supported for perceived competence and intrinsic motivation. More specifically, for students in higher SES families, the effect of mastery-approach goals on perceived competence and intrinsic motivation was stronger for students from more affluent families. Third, the reduction hypothesis received support with regard to school SES as the association between mastery-approach goals and learning-related outcomes was weaker for students in more affluent schools.

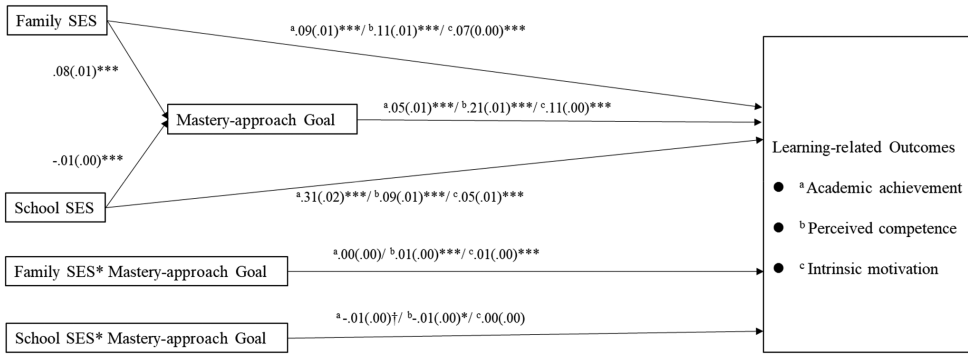

FIGURE 3 Multilevel moderated mediation model. *$p < .05$; ***$p < .001$; only standardized coefficients are shown; a = academic achievement; b = perceived competence; and c = intrinsic motivation.

Mediation

This study contributes to the achievement goal literature by showing how SES shapes students' mastery-approach goals. Students from more affluent families had higher mastery-approach goals which, in turn, were associated with higher achievement, perceived competence and intrinsic motivation, thereby supporting H1a. However, H1b was not supported, as the association between school-SES and mastery-approach goals was negative. In higher SES schools, mastery-approach goals were lower.

Research conducted by Luthar and colleagues (2018, 2020) might shed light on this latter counterintuitive finding. In affluent schools, the pressure to excel is excessive, such that it is listed among the top high-risk factors for adolescent students' mental well-being. High performance pressures are inimical to the adoption of mastery-approach goals.

Moderation effects

Family and school SES moderated the learning-related outcomes in different ways. For family SES, the universalist and amplification hypotheses were more supported. However, for school SES, the reduction hypothesis was more supported.

Family SES

The positive association between mastery-approach goals and achievement was not moderated by family SES, providing support for the *universalist hypothesis* (H2a). These results somewhat contradict past studies. For example, Darnon et al. (2018) found that mastery-approach goals were positively associated with final grades for students from lower SES families, but not for students from higher SES families. A study by Smeding et al. (2013) also found that mastery-approach goals were more powerful predictors of final grades for lower SES students.

Perhaps, at least part of the reason for the difference between our findings and that of Darnon et al. (2018) and Smeding et al. (2013) was differences in participants' age. These prior studies focused on college students, whereas our study focused on secondary school students. College students usually have considerable freedom and autonomy (e.g., in choosing majors and electives), whereas in secondary schools, most of the curriculum is fixed. Hence, it is possible that mastery-approach goals are more

relevant predictors of achievement outcomes in universities and less so for high school students, especially those for lower SES families.

Regarding perceived competence and intrinsic motivation, we found that family SES strengthened the effects of mastery-approach goals on perceived competence and intrinsic motivation, providing support for the *amplification hypothesis* (H2b). For students from high-SES families, the relationship between mastery-approach goals and perceived competence and intrinsic motivation was stronger. Students from more affluent families have greater opportunities to select, engage in and attend to educational opportunities, whereas for those in deprived environments, the process by which students transform their mastery-approach goals into greater learning and absorption is probably disrupted.

School SES

We also found evidence that school SES reduced the effect of mastery-approach goals on each of the learning-related outcomes, thereby supporting the *reduction hypothesis*. For students in more affluent schools, the association between mastery-approach goals and outcomes, including achievement, perceived competence and intrinsic motivation, was weaker.

This support for the reduction hypothesis could be due to the climate in affluent schools. Research by Luthar et al. (2018, 2020) has shown that affluent schools are characterized by high pressure to achieve which might make performance-approach goals (i.e., striving to outperform other students) more salient. In such contexts, performance-approach goals might be more relevant predictors of achievement (Elliot et al., 2018; Hulleman et al., 2010). Performance-based goals that focus on competition and performance might represent a closer fit to the environmental affordances in highly competitive affluent schools. Perhaps, this accounts for why the association between mastery-approach goals and key learning-related outcomes was weaker in high-SES schools.

Implications

Our study has important theoretical implications. Despite the rich body of work on achievement goals on the one hand and socio-economic status on the other, these two bodies of literature have proceeded in parallel with little cross-fertilization. Achievement goal researchers have seldom examined the role of SES. However, the broader economic context is also critical to shaping the types of achievement goals that students endorse and also their broader motivational orientations (Destin et al., 2019, King, 2022, 2024).

Achievement goals continue to be an active area of research for over four decades of investigation. This study contributes to this influential and generative body of work by showing how SES at both the family and school level is associated with the extent to which students adopt mastery-approach goals. Furthermore, it also shows that the association between mastery-approach goals and other learning-related outcomes is moderated by SES.

Our study also has practical implications. We found that mastery-approach goals were positive predictors of achievement, perceived competence and intrinsic motivation, thereby demonstrating the utility of mastery-approach and encouraging its adoption among students. However, it is also important to recognize that mastery-approach goals are not a panacea for solving educational inequalities. In fact, mastery-approach goals might even exacerbate inequalities in some instances, as students from high SES families gain more dividends from adopting mastery-approach goals (see also Bernardo, 2022; King & Trinidad, 2021; Zheng et al., 2019 for similar results).

On the other side of the economic spectrum, there might also be a need to look more closely into highly affluent schools. The lower levels of mastery-approach goals among such schools may reflect their high-pressure environments. Hence, educators would do well to proactively and explicitly promote a mastery-goal climate in such schools.

Limitations and directions for future research

In addition to its strengths, this research has limitations. First, PISA data are cross-sectional, therefore, empirical work with PISA data does not afford causal conclusions. Future studies that track students longitudinally would be an important advance. Second, we focused on mastery-approach goals to the exclusion of other types of achievement goals; this was necessary given that the PISA 2018 study only measured mastery-approach goals. Future research would do well to examine how SES relates to other achievement goals, and to other competence-relevant constructs more broadly, to further deepen our understanding of this intriguing and informative link between SES and achievement motivation.

CONCLUSION

Our study provides a clearer understanding of the connections among family SES, school SES, mastery-approach goals and key learning-related outcomes. Adopting mastery-approach goals is generally advantageous for students across socio-economic strata. Our research also shows that the positive dividends of mastery-approach goals are unequal. Students from high-SES families generally have higher mastery-approach goals. Furthermore, students from high-SES families seem to benefit more from mastery-approach goals. Our research significantly advances the achievement goal approach to achievement motivation by showing that students' motivational experiences are often powerfully shaped by broad structural conditions, namely their family and school SES.

AUTHOR CONTRIBUTIONS

Ronnel B. King: Conceptualization; writing – original draft; supervision. **Faming Wang:** Methodology; formal analysis; data curation. **Shing On Leung:** Writing – review and editing; validation. **Andrew Elliot:** Writing – review and editing; conceptualization.

CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in PISA 2018 database at https://www.oecd.org/pisa/data/2018database/. These data were derived from the following resources available in the public domain: Student Questionnaire Data File, https://www.oecd.org/pisa/data/2018database/.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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